

Application Serial No. 10/828,530
Atty. Docket No. **ARL 03-60**
Reply to Office Action of 22 Feb. 2007 & RCE

Confirmation No. 4322
Inventor: Kecske et al.
Amendment dated 8/21/07

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently amended) A metallic glass alloy having the ratio of elements of the formula $\text{Hf}_a\text{Cu}_b\text{Ni}_c\text{Al}_d\text{Y}_e$ wherein;

Y comprises at least one element from Group IVA, IVB, VA, or VB;
a is less than 45 atomic percent;
b is from about 15 to about 35 atomic percent;
c is from about 5 to about 25 atomic percent;
d is from about 0 to about 20 atomic percent; and
e is from about 0 to about 15 atomic percent, wherein $a+b+c+d+e=100$.
2. (Previously presented) The metallic glass alloy of claim 1, wherein a is 44.5 atomic percent or less.
3. (Previously presented) The metallic glass alloy of claim 2, wherein Y is Ti or Nb.
4. (Previously presented) The metallic glass alloy of claim 1, further comprising a density greater than about 7 g/cm³.
5. (Currently amended) The metallic glass alloy of claim 4, wherein the density is about 10.5 g/cm³ [or more].
6. (Currently amended) The metallic glass alloy of claim 1, wherein the alloy exhibits a distinct glass transition temperature, [which] that is at least 0.59 of the liquidus temperature of the alloy.

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7. (Previously presented) The metallic glass alloy of claim 1, wherein the ratio of Cu to Ni is 2:1.
8. (Previously presented) The metallic glass alloy of claim 3, wherein the ratio of Cu to Ni is 2:1.
9. (Previously presented) The metallic glass alloy of claim 3, having about 5 or more atomic percent Ti.
10. (Previously presented) The metallic glass alloy of claim 3, having about 5 or more atomic percent Nb.
11. (Previously presented) The metallic glass alloy of claim 1, wherein d is about 10 or more.
12. (Previously presented) The metallic glass alloy of claim 1, wherein $35 < a < 45$, $0.1 < d < 20$, and $0.1 < e < 15$.
13. (Previously presented) An article comprising the metallic glass alloy of claim 1.
14. (Previously presented) The article of claim 13 having a thickness of at least 1 millimeter in its smallest dimension.
15. (Previously presented) The article of claim 13 having a thickness at least 3 millimeters in its smallest dimension.
16. (Previously presented) A metallic glass alloy composition comprising:
44.5 atomic percent hafnium;

about 27 atomic percent copper;
about 13.5 atomic percent nickel;
about 10 atomic percent aluminum; and
about 5 atomic percent titanium or niobium.

17. (Previously presented) The composition of claim 16 having a density greater than 7 g/cm³.

18. (Previously presented) The composition of claim 16, having a density of about 10.9 g/cm³ or more.

19. (Previously presented) The composition of claim 16, wherein the composition exhibits a distinct glass transition temperature of at least 0.59 of the liquidus temperature of the composition.

20. (Previously presented) An article comprising the metallic glass alloy of claim 16.

21. (Previously presented) The article of claim 20 having a thickness of at least 1 millimeter in its smallest dimension.

22. (Previously presented) The article of claim 20 having a thickness of at least 3 millimeters in its smallest dimension.

23. (Previously presented) The article of claim 20, wherein the ratio of copper to nickel is 2:1.

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24. (Previously presented) The article of claim 20, wherein the metallic glass is at least partially amorphous.
25. (Previously presented) The article of claim 20, wherein the article has an elastic strain to failure between about 1.8 and 2.2 percent elongation.
26. (Previously presented) The article of claim 20, wherein the object has a quasi-static compressive yield stress of between about 1.8 and 2.2 GPa.
27. (Previously presented) The article of claim 20, wherein the object has a dynamic high-strain-rate yield stress of between about 1.3 and 1.6 GPa.
28. (Previously presented) A metallic glass alloy comprising Hf, Cu, and Ni in eutectic combination with Al, Ti, Nb or a combination thereof, having a density greater than about 7 g/cm³.
29. (Previously presented) A method for forming a metallic glass alloy comprising:
combining 44.5 atomic percent hafnium;
about 27 atomic percent copper;
about 13.5 atomic percent nickel;
about 10 atomic percent aluminum; and
about 5 atomic percent titanium or niobium.
30. (Previously presented) The metallic glass alloy of claim 1, wherein the alloy is formed by electric arc melting.
31. (Previously presented) The metallic glass alloy of claim 1, wherein the alloy is formed by induction melting.

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32. (Previously presented) The article of claim 16, wherein the article is formed by vacuum suction casting.

33. (Previously presented) The article of claim 16, wherein the article is formed by permanent mold casting, injection die casting, pour casting, planar flow casting, melt spinning, or extrusion.

34. (Currently amended) A method for making an alloy generally represented by the formula Hf_aCu_bNi_cAl_dY_e, Y includes at least one element selected from Group IV transition metal elements, wherein Hf is not equal to Y, Group VA, VIII, IVB, and VB, wherein a+b+c+d+e=100% (atomic percent), and a is less than 45, comprising:

eutectically combining Hf, Cu, and Ni with Al, Ti, Nb or a combination thereof, to form a metallic glass alloy having a density greater than about 7 g/cm³.

35. (Currently amended) An alloy according to Claim 34 comprising Hf, Cu, and Ni wherein preferably 35<a<45, 15<b<35, 5<c<25, 0<d<20, and 0<e<15 in an invariant combination.

36. (Previously presented) The alloy of Claim 35 in eutectic combination with Al.

37. (Previously presented) The alloy of Claim 36 in eutectic combination with Ti and Nb or a combination thereof.

38. (Previously presented) The alloy of Claim 35 in eutectic combination with an element from Group IVA or Group IVB.

39. (Previously presented) The alloy of Claim 36 in eutectic combination with an element from Group IVA or Group IVB.